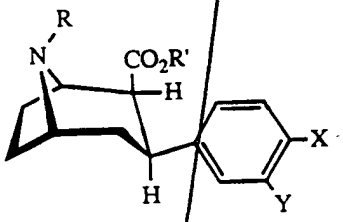
CLAIMS

What is claimed is:

1. An iodinated neuroprobe for mapping monoamine reuptake sites, the iodinated neuroprobe being of the formula:



wherein

R = a C_nH_{2n+1} group where n=0-6, an alkenyl group, a monofluoroalkyl group including ^{n}F where n=18 or 19, or a $^{m}C_nH_{2n+1}$ group where n=1-6 and where m=11 or 14 for at least one ^{m}C;

R′= a C_nH_{2n+1} group where n=0-6, a *p*-iodophenylmethyl group, a *p*-iodophenylethyl group, a phenylmethyl group, or a phenylethyl group;

X = an isotope of F, an isotope of Cl, an isotope of Br, an isotope of I, CH_3, or $Sn(R"_1R"_2R"_3)$;

$R"_1$= a C_nH_{2n+1} group where n=1-6, or an aryl group;

$R"_2$= a C_nH_{2n+1} group where n=1-6, or an aryl group;

$R"_3$= a C_nH_{2n+1} group where n=1-6, or an aryl group; and

Y = H only if X is an isotope of I, or R′ is a *p*-iodophenylmethyl group, or R′ is a *p*-iodophenylethyl group, else Y = an isotope of I.

2. The iodinated neuroprobe of claim 1 wherein the *p*-iodophenylmethyl group incorporates a radioactive isotope of iodine.

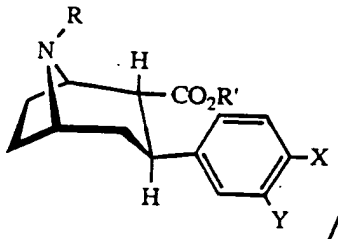
3. The iodinated neuroprobe of claim 1 wherein the *p*-iodophenylethyl group incorporates a radioactive isotope of iodine.

4. The iodinated neuroprobe of claim 1 wherein X = ^{123}I.

5. The iodinated neuroprobe of claim 1 wherein X = ^{125}I.

6. The iodinated neuroprobe of claim 1 wherein X = ^{131}I.

7. An iodinated neuroprobe for mapping monoamine reuptake sites, the iodinated neuroprobe being of the formula:



wherein

R = a C_nH_{2n+1} group where n=0-6, an alkenyl group, a monofluoroalkyl group including ^{n}F where n=18 or 19, or a $^{m}C_nH_{2n+1}$ group where n=1-6 and where m=11 or 14 for at least one ^{m}C;

R′= a C_nH_{2n+1} group where n=0-6, a *p*-iodophenylmethyl group, a *p*-iodophenylethyl group, a phenylmethyl group, or a phenylethyl group;

X = an isotope of F, an isotope of Cl, an isotope of Br, an isotope of I, CH_3, or $Sn(R"_1R"_2R"_3)$;

$R"_1$= a C_nH_{2n+1} group where n=1-6, or an aryl group;

$R"_2$= a C_nH_{2n+1} group where n=1-6, or an aryl group;

R''_3= a C_nH_{2n+1} group where n=1-6, or an aryl group; and

Y = H only if X is an isotope of I, or R′ is a *p*-iodophenylmethyl group, or R′ is a *p*-iodophenylethyl group, else Y = an isotope of I.

8. The iodinated neuroprobe of claim 7 wherein the *p*-iodophenylmethyl group incorporates a radioactive isotope of iodine.

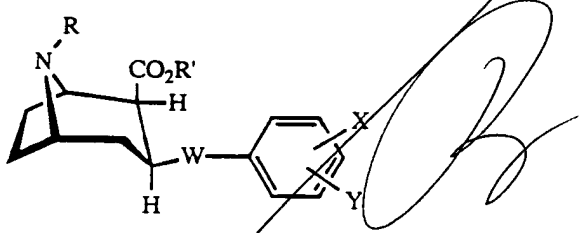
9. The iodinated neuroprobe of claim 7 wherein the *p*-iodophenylethyl group incorporates a radioactive isotope of iodine.

10. The iodinated neuroprobe of claim 5 wherein X = ^{123}I.

11. The iodinated neuroprobe of claim 5 wherein X = ^{125}I.

12. The iodinated neuroprobe of claim 5 wherein X = ^{131}I.

13. An iodinated neuroprobe for mapping monoamine reuptake sites, the iodinated neuroprobe being of the formula:



wherein

R = a C_nH_{2n+1} group where n=0-6, an alkenyl group, a monofluoroalkyl group including ^{n}F where n=18 or 19, or a $^{m}C_nH_{2n+1}$ group where n=1-6 and where m=11 or 14 for at least one ^{m}C;

R′= a C_nH_{2n+1} group where n=0-6, a *p*-iodophenylmethyl group, a *p*-iodophenylethyl group, a phenylmethyl group, or a phenylethyl group;

X = an isotope of F, an isotope of Cl, an isotope of Br, an isotope of I, CH_3, or $Sn(R"_1R"_2R"_3)$;

$R"_1$= a C_nH_{2n+1} group where n=1-6, or an aryl group;

$R"_2$= a C_nH_{2n+1} group where n=1-6, or an aryl group;

$R"_3$= a C_nH_{2n+1} group where n=1-6, or an aryl group;

Y = H only if X is an isotope of I, or R′ is a *p*-iodophenylmethyl group, or R′ is a *p*-iodophenylethyl group, else Y = an isotope of I; and

W = O, S, $(CH_2)_n$, $O(CH_2)_n$ where n=1-6,

wherein X resides on a benzene ring of the formula at an ortho, meta, or para position with respect to W, and Y resides at any remaining position on the benzene ring.

14. The iodinated neuroprobe of claim 13 wherein the *p*-iodophenylmethyl group incorporates a radioactive isotope of iodine.

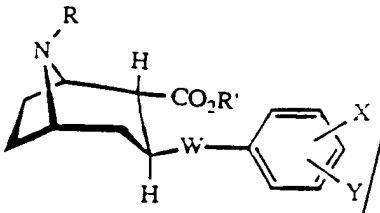
15. The iodinated neuroprobe of claim 13 wherein the *p*-iodophenylethyl group incorporates a radioactive isotope of iodine.

16. The iodinated neuroprobe of claim 13 wherein X = ^{123}I.

17. The iodinated neuroprobe of claim 13 wherein X = ^{125}I.

18. The iodinated neuroprobe of claim 13 wherein X = ^{131}I.

19. An iodinated neuroprobe for mapping monoamine reuptake sites, the iodinated neuroprobe being of the formula:



wherein

R = a C_nH_{2n+1} group where n=0-6, an alkenyl group, a monofluoroalkyl group including ^{n}F where n=18 or 19, or a $^{m}C_nH_{2n+1}$ group where n=1-6 and where m=11 or 14 for at least one ^{m}C;

R′= a C_nH_{2n+1} group where n=0-6, a *p*-iodophenylmethyl group, a *p*-iodophenylethyl group, a phenylmethyl group, or a phenylethyl group;

X = an isotope of F, an isotope of Cl, an isotope of Br, an isotope of I, CH_3, or $Sn(R"_1R"_2R"_3)$;

$R"_1$= a C_nH_{2n+1} group where n=1-6, or an aryl group;

$R"_2$= a C_nH_{2n+1} group where n=1-6, or an aryl group;

$R"_3$= a C_nH_{2n+1} group where n=1-6, or an aryl group;

Y = H only if X is an isotope of I, or R′ is a *p*-iodophenylmethyl group, or R′ is a *p*-iodophenylethyl group, else Y = an isotope of I; and

W = O, S, $(CH_2)_n$, $O(CH_2)_n$ where n=1-6,

wherein X resides on a benzene ring of the formula at an ortho, meta, or para position with respect to W, and Y resides at any remaining position on the benzene ring.

20. The iodinated neuroprobe of claim 19 wherein the *p*-iodophenylmethyl group incorporates a radioactive isotope of iodine.

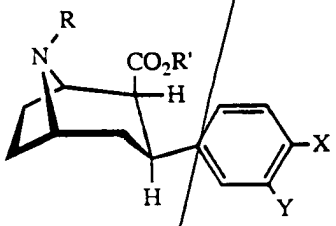
21. The iodinated neuroprobe of claim 19 wherein the *p*-iodophenylethyl group incorporates a radioactive isotope of iodine.

22. The iodinated neuroprobe of claim 19 wherein X = ^{123}I.

23. The iodinated neuroprobe of claim 19 wherein X = ^{125}I.

24. The iodinated neuroprobe of claim 19 wherein X = ^{131}I.

25. A precursor of a radiolabled neuroprobe for mapping monoamine reuptake sites, the precursor being of the formula:



wherein

R = a C_nH_{2n+1} group where n=0-6, an alkenyl group, or a monofluoroalkyl group;

R′= a C_nH_{2n+1} group where n=0-6, a *p*-iodophenylmethyl group, a *p*-iodophenylethyl group, a phenylmethyl group, or a phenylethyl group;

X = F, Cl, Br, I, CH_3, or $Sn(R"_1R"_2R"_3)$;

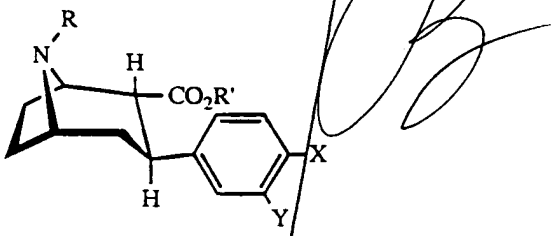
$R"_1$= a C_nH_{2n+1} group where n=1-6, or an aryl group;

$R"_2$= a C_nH_{2n+1} group where n=1-6, or an aryl group;

$R"_3$= a C_nH_{2n+1} group where n=1-6, or an aryl group; and

Y = H only if X is I, or R′ is a *p*-iodophenylmethyl group, or R′ is a *p*-iodophenylethyl group, else Y = I.

26. A precursor of a radiolabled neuroprobe for mapping monoamine reuptake sites, the precursor being of the formula:



wherein

R = a C_nH_{2n+1} group where n=0-6, an alkenyl group, or a monofluoroalkyl group;

R′= a C_nH_{2n+1} group where n=0-6, a *p*-iodophenylmethyl group, a *p*-iodophenylethyl group, a phenylmethyl group, or a phenylethyl group;

X = F, Cl, Br, I, CH_3, or $Sn(R"_1R"_2R"_3)$;

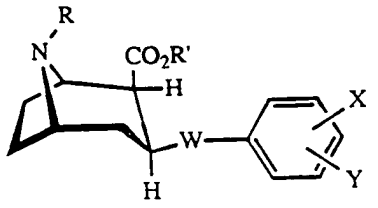
$R"_1$= a C_nH_{2n+1} group where n=1-6, or an aryl group;

$R"_2$= a C_nH_{2n+1} group where n=1-6, or an aryl group;

R''_3= a C_nH_{2n+1} group where n=1-6, or an aryl group; and

Y = H only if X is I, or R′ is a *p*-iodophenylmethyl group, or R′ is a *p*-iodophenylethyl group, else Y = I.

27. A precursor of a radiolabled neuroprobe for mapping monoamine reuptake sites, the precursor being of the formula:



wherein

R = a C_nH_{2n+1} group where n=0-6, an alkenyl group, or a monofluoroalkyl group;

R′= a C_nH_{2n+1} group where n=0-6, a *p*-iodophenylmethyl group, a *p*-iodophenylethyl group, a phenylmethyl group, or a phenylethyl group;

X = F, Cl, Br, I, CH_3, or $Sn(R''_1R''_2R''_3)$;

R''_1= a C_nH_{2n+1} group where n=1-6, or an aryl group;

R''_2= a C_nH_{2n+1} group where n=1-6, or an aryl group;

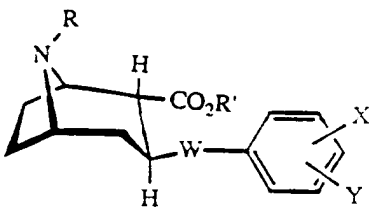
R''_3= a C_nH_{2n+1} group where n=1-6, or an aryl group;

Y = H only if X is I, or R′ is a *p*-iodophenylmethyl group, or R′ is a *p*-iodophenylethyl group, else Y = I; and

W = O, S, $(CH_2)_n$, $O(CH_2)_n$ where n=1-6,

wherein X resides on a benzene ring of the formula at an ortho, meta, or para position with respect to W, and Y resides at any remaining position on the benzene ring.

28. A precursor of a radiolabled neuroprobe for mapping monoamine reuptake sites, the precursor being of the formula:



wherein

R = a C_nH_{2n+1} group where n=0-6, an alkenyl group, or a monofluoroalkyl group;

R′= a C_nH_{2n+1} group where n=0-6, a *p*-iodophenylmethyl group, a *p*-iodophenylethyl group, a phenylmethyl group, or a phenylethyl group;

X = F, Cl, Br, I, CH_3, or $Sn(R"_1R"_2R"_3)$;

$R"_1$= a C_nH_{2n+1} group where n=1-6, or an aryl group;

$R"_2$= a C_nH_{2n+1} group where n=1-6, or an aryl group;

$R"_3$= a C_nH_{2n+1} group where n=1-6, or an aryl group;

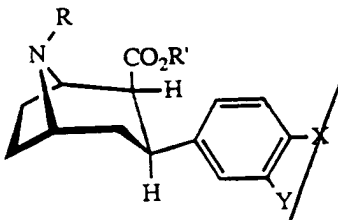
Y = H only if X is I, or R′ is a *p*-iodophenylmethyl group, or R′ is a *p*-iodophenylethyl group, else Y = I; and

W = O, S, $(CH_2)_n$, $O(CH_2)_n$ where n=1-6,

wherein X resides on a benzene ring of the formula at an ortho, meta, or para position with respect to W, and Y resides at any remaining position on the benzene ring.

29. A kit for preparing an iodinated neuroprobe for mapping monoamine reuptake sites, the kit comprising:

a precursor of the formula:



wherein

R = a C_nH_{2n+1} group where n=0-6, an alkenyl group, or a monofluoroalkyl group;

R′= a C_nH_{2n+1} group where n=0-6, a *p*-iodophenylmethyl group, a *p*-iodophenylethyl group, a phenylmethyl group, or a phenylethyl group;

X = F, Cl, Br, I, CH_3, or $Sn(R"_1R"_2R"_3)$;

$R"_1$= a C_nH_{2n+1} group where n=1-6, or an aryl group;

$R"_2$= a C_nH_{2n+1} group where n=1-6, or an aryl group;

$R"_3$= a C_nH_{2n+1} group where n=1-6, or an aryl group; and

Y = H only if X is I, or R′ is a *p*-iodophenylmethyl group, or R′ is a *p*-iodophenylethyl group, else Y = I; and

an oxidizing agent,

wherein the precursor and the oxidizing agent are to be reacted in the presence of a radioisotope source.

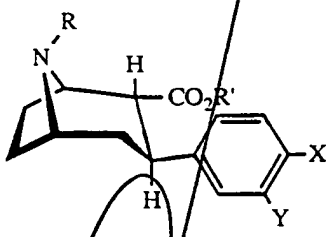
30. The kit of claim 29 wherein the radioisotope source is a solution of a salt of a radioactive isotope of iodine.

31. The kit of claim 29 wherein the radioisotope source is a reagent containing $^{m}C_nH_{2n+1}X$ where n=0-6 and X is a leaving group.

32. The kit of claim 29 wherein the radioisotope source is a reagent containing ^{18}F of the formula $FC_nH_{2n}X$ where n=0-6 and X is a leaving group.

33. A kit for preparing an iodinated neuroprobe for mapping monoamine reuptake sites, the kit comprising:

a precursor of the formula:



wherein

R = a C_nH_{2n+1} group where n=0-6, an alkenyl group, or a monofluoroalkyl group;

R′= a C_nH_{2n+1} group where n=0-6, a *p*-iodophenylmethyl group, a *p*-iodophenylethyl group, a phenylmethyl group, or a phenylethyl group;

X = F, Cl, Br, I, CH_3, or $Sn(R"_1R"_2R"_3)$;

$R"_1$= a C_nH_{2n+1} group where n=1-6, or an aryl group;

$R"_2$= a C_nH_{2n+1} group where n=1-6, or an aryl group;

$R"_3$= a C_nH_{2n+1} group where n=1-6, or an aryl group; and

Y = H only if X is I, or R′ is a *p*-iodophenylmethyl group, or R′ is a *p*-iodophenylethyl group, else Y = I; and

an oxidizing agent,

wherein the precursor and the oxidizing agent are to be reacted in the presence of a radioisotope source.

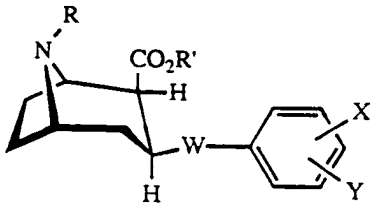
34. The kit of claim 33 wherein the radioisotope source is a solution of a salt of a radioactive isotope of iodine.

35. The kit of claim 33 wherein the radioisotope source is a reagent containing $^{m}C_nH_{2n+1}X$ where n=0-6 and X is a leaving group.

36. The kit of claim 33 wherein the radioisotope source is a reagent containing ^{18}F of the formula $FC_nH_{2n}X$ where n=0-6 and X is a leaving group.

37. A kit for preparing an iodinated neuroprobe for mapping monoamine reuptake sites, the kit comprising:

a precursor of the formula:



wherein

R = a C_nH_{2n+1} group where n=0-6, an alkenyl group, or a monofluoroalkyl group;

R'= a C_nH_{2n+1} group where n=0-6, a *p*-iodophenylmethyl group, a *p*-iodophenylethyl group, a phenylmethyl group, or a phenylethyl group;

X = F, Cl, Br, I, CH_3, or $Sn(R"_1R"_2R"_3)$;

R''_1= a C_nH_{2n+1} group where n=1-6, or an aryl group;

R''_2= a C_nH_{2n+1} group where n=1-6, or an aryl group;

R''_3= a C_nH_{2n+1} group where n=1-6, or an aryl group;

Y = H only if X is I, or R′ is a *p*-iodophenylmethyl group, or R′ is a *p*-iodophenylethyl group, else Y = I; and

W = O, S, $(CH_2)_n$, $O(CH_2)_n$ where n=1-6,

wherein X resides on a benzene ring of the formula at an ortho, meta, or para position with respect to W, and Y resides at any remaining position on the benzene ring; and

an oxidizing agent,

wherein the precursor and the oxidizing agent are to be reacted in the presence of a radioisotope source.

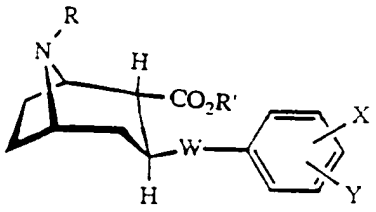
38. The kit of claim 37 wherein the radioisotope source is a solution of a salt of a radioactive isotope of iodine.

39. The kit of claim 37 wherein the radioisotope source is a reagent containing $^{m}C_nH_{2n+1}X$ where n=0-6 and X is a leaving group.

40. The kit of claim 37 wherein the radioisotope source is a reagent containing ^{18}F of the formula $FC_nH_{2n}X$ where n=0-6 and X is a leaving group.

41. A kit for preparing an iodinated neuroprobe for mapping monoamine reuptake sites, the kit comprising:

a precursor of the formula:



wherein

R = a C_nH_{2n+1} group where n=0-6, an alkenyl group, or a monofluoroalkyl group;

R′= a C_nH_{2n+1} group where n=0-6, a *p*-iodophenylmethyl group, a *p*-iodophenylethyl group, a phenylmethyl group, or a phenylethyl group;

X = F, Cl, Br, I, CH_3, or $Sn(R"_1R"_2R"_3)$;

$R"_1$= a C_nH_{2n+1} group where n=1-6, or an aryl group;

$R"_2$= a C_nH_{2n+1} group where n=1-6, or an aryl group;

$R"_3$= a C_nH_{2n+1} group where n=1-6, or an aryl group;

Y = H only if X is I, or R′ is a *p*-iodophenylmethyl group, or R′ is a *p*-iodophenylethyl group, else Y = I; and

W = O, S, $(CH_2)_n$, $O(CH_2)_n$ where n=1-6,

wherein X resides on a benzene ring of the formula at an ortho, meta, or para position with respect to W, and Y resides at any remaining position on the benzene ring; and

an oxidizing agent,

wherein the precursor and the oxidizing agent are to be reacted in the presence of a radioisotope source.

42. The kit of claim 41 wherein the radioisotope source is a solution of a salt of a radioactive isotope of iodine.

43. The kit of claim 41 wherein the radioisotope source is a reagent containing $^{m}C_nH_{2n+1}X$ where n=0-6 and X is a leaving group.

44. The kit of claim 41 wherein the radioisotope source is a reagent containing ^{18}F of the formula $FC_nH_{2n}X$ where n=0-6 and X is a leaving group.

45. The kit of claim 29, 33, 37, or 41 wherein the oxidizing agent is selected from the group consisting of perchloric acid, performic acid, peracetic acid, hydrogen peroxide, hydrogen peroxide with lactoperoxidase, 1,3,4,6-tetrachloro-3α,6α-diphenylglycouril, and N-chloro-4-methylbenzenesulfonamide sodium salt.